Availability of Guidestars for SIM

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ABSTRACT

The Space Interferometer Mission (SIM) will rely on a pair of astrometrically stable guidestars to monitor spacecraft orientation and vibration during its observations of each science target. The availability of guidestar candidates depends upon various astrophysical constraints (stellar magnitude, spectral type, luminosity class, luminosity variation, color, and multiplicity). The guidestars must exhibit photocentric motions of no more than ~1 microarcsecond during the ~1 hour observation period, be sufficiently bright to allow fringe tracking at kilohertz rates, and be suitably positioned to allow them to be observed by the guide interferometers during the science observations. The range of acceptable positions for the guidestars for a given science target depends on the field of regard (FOR) of the science interferometer. This paper presents a study of the statistics of candidate guidestars for a variety of options for the FOR, and looked at the statistics of spacecraft orientations excluded due to the lack of available guidestar orientations for each target. We find that sufficient guidestars are available for nearly the whole sky, provided that the science FOR allows for a primary guidestar search annulus width of at least two degrees, depending on the astrophysical constraints.